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SOME CONSIDERATIONS IN VITAL STATISTICS EDUCATION*

By Louis I. Dublin and Edwin W. Kopf.

The past decade has witnessed an encouraging growth in American vital statistics. The variety of the subjects inquired into, the expert methods employed and the increasing number of persons engaged in the work all indicate a wholesome development in this branch of knowledge. The federal registration service has been expanded until, at the present time, the records of mortality are collected and compiled for nearly 80 per cent., and the records of births for 53 per cent. of the population of the United States. The annual reports of both births and deaths, as now issued by the Bureau of the Census, are increasingly well constructed and significant documents. Tabulations of data on population structure, derived from the results of the 1910 Census, have become available in detail not displayed for any preceding enumeration. Our federal data now compare favorably with the best publications on vital statistics issued by the European countries. Along with this development have come also numerous contributions from the vital statistics offices of the several states and cities and from the laboratories of public and private agencies which have used vital statistics as an organ of public health work. It is instructive, therefore, to inquire whether, under these promising conditions, there has been a corresponding growth in the facilities for vital statistics education. Surely, the number of those who are competent to utilize the volume of data must be increased, and some thought must be given to the character and scope of the training of those who are to prepare and analyze our vital records.

For many years, the American Statistical Association was the only medium for the exchange of opinion on vital statistics practice in the United States. The early leaders of the Association, including Jarvis, Elliott, Walker and Shattuck actively promoted standards of legislation and of registration in the states and advocated a programme of Federal vital statistics. The QUARTERLY PUBLICATIONS of the Association, and the constant improvement of the character of our vital statistics, bear witness to the productive work of these men. The QUARTERLY was also the means wherein standards for the registration of vital data and for their analysis were discussed by official, academic and private statisticians. The American Statistical Association played a most important part in the founding and establishing of our vital statistics. Its interests, however, were general and not specific in this particular branch of statistical science. It was necessary, therefore, that an organization with more limited aims be founded and this was accomplished in 1907, with the organization of the Section on Vital Statistics in the American Public Health Association. This group was composed, for the most part, of registrars and statisticians connected with the United States Bureau of the Census and of a number of the leading state and municipal vital statistics offices. The founding of the section at once provided a means for the dissemination of the standards which had slowly been established by the best agencies in the country. The history of our vital statistics since 1907 has centered largely around this group of public health statisticians, many of whom are members also of the American Statistical Association. Rules of approved statistical practice have emanated from this section and the registrars who, for the most part, had secured no other training than through actual contact with their official material, have obtained safe guides for the conduct of their work. While this method is not altogether satisfactory as a means of training vital statisticians, it has been until recently virtually the only one available to those who aspired to some degree of competence in this field.

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A few of the universities and colleges of the country at about this time became aware of their obligation to provide instruction to qualified students, and a few actually established definite courses in vital statistics. But from a survey of the announcements of the more important institutions, it seems that there is still wide variation of opinion as to what constitutes the material and the method of vital statistics. The definitions implied in these announcements seem to vary with the points of view of the departments in which the courses are given. In medical schools, occasional lectures on vital statistics are given in connection with courses in preventive medicine. In schools of hygiene and public health, the courses are subordinate to those on biometry, epidemiology or general public health administration. In schools of commerce and of business administration, vital statistics seems to be incidental to insurance and economics courses. The emphasis is then on the economic aspects of population and of its movement or functioning. Some of these courses are purely descriptive of the processes of registration and of tabulation of crude data; others emphasize the analytical or mathematical methods of the science to the virtual exclusion of descriptive subject matter. There is hardly any agreement upon what constitutes vital statistics; upon what elements of the science are constant in the several fields of its application; and upon what variations in the superstructure of vital statistics are necessary to teach the subject to the several types of students and workers. We shall, accordingly, in this statement, attempt to determine which groups are most in need of such instruction, and, second, to suggest a program of education in vital statistics adapted to these several groups. It is hoped that this outline will form the basis of productive discussion.

VITAL STATISTICS EDUCATION IN SCHOOLS OF GENERAL MEDICINE.

There are, first, the students of medicine, the future practitioners, who are to be the initial recorders of most of our vital statistics data, namely, those of birth, death, sickness and accident. The physicians of the country, in a very final way, determine the completeness of the count of our vital phenomena and the accuracy and the detail of statement. Instruction in vital statistics should, therefore, be planned as an essential element in their education. In view of the crowded condition of the medical curriculum, instruction should be introduced with moderation and discretion. Emphasis should be placed upon the urgency of complete and accurate registration especially of births, of deaths and the diseases causing death, and of cases of notifiable disease. Instruction should be given how properly to complete such official records. The future physician should know the uses to which such records are put by the health authorities of his community and the legal importance of these documents to his patients or their heirs. He should be familiar with the elementary processes necessary to derive the essential indices of community vital statistics such as birth rates, death rates, infant mortality rates, sickness rates, etc.

Instruction in vital statistics has, in addition, very important bearings upon the general education of the medical student. The value of future medical research will depend in some part upon the ability and readiness of physicians to record the essential facts in their cases and to derive from their records the underlying principles of their practice. The student of medicine should be taught to understand that the principles of his science are developed and advanced in two ways; first, by the so-called *intensive* and second, by the *extensive* method of observing vital phenomena and processes. The sciences of anatomy, physiology, histology and pathology represent the intensive approach. They represent the collection of facts and conclusions on the normal and abnormal in the structure and function of individuals and of their organs. They typify science in its description of individuals in terms of the individual. But the science of medicine also attempts to draw conclusions from the consideration of large groups of cases and the analysis of the data for such aggregations. The student should be taught that from this viewpoint vital statistics is in general the engine of research for establishing those conclusions which are based upon the proper observation of masses of cases. Thus, vital statistics in the school of medicine should be taught perhaps in the department of research medicine as a method of discovery of generalized medical truth.

VITAL STATISTICS EDUCATION IN SCHOOLS OF PUBLIC HEALTH.

Then there are the students and workers in public health and hygiene who must understand and use vital statistics in their specialty. In fact, the results of statistical inquiry are the very foundation and the guide for their programmes of operation. The development of statistical data and technique in America has been and will continue to be largely in their hands. Yet the larger number of public health workers have been, for the most part, trained in the hard school of experience with only the precepts of a few successful vital statisticians to guide them. They have entered their field with perhaps a training confined to the principles and practice of medicine obtained before the days of the modern schools of public health and have received hardly any formal or systematic instruction in statistical method. This is evident to any one who examines the large number of weekly, monthly and annual reports issued by the health departments of states and cities. For the most part these reports do not as yet attain the required standards of statistical practice. A very valuable source of information is thus impaired both for the use of the public and of the specialists in health work.

The students in graduate schools of public health are now much more fortunate. Courses in vital statistics are provided and these cover the field fairly extensively. In general, their instruction seems to cover the ground of such a text as Newsholme's or of Whipple's recent book. Courses for health officers should emphasize the value of registration and the need for sound legislation for the establishment and enforcement of such registration. There should be instruction in classification technique especially for such items as statements of cause of death and of occupation. Time should be given to tabulation practice and to statistical arithmetic including the preparation of graphic representations. Such courses should, in a sense, cover the entire field of demography, embracing the amount and extent of community losses which result from the incidence of communicable disease and preventable death. In view of the fact that support of health work in the last analysis depends upon public opinion, the student should receive instruction in the preparation of reports, of health literature and of exhibits which will portray the results of his work and the need for its maintenance and extension.

VITAL STATISTICS EDUCATION FOR STUDENTS OF SOCIAL AND POLITICAL SCIENCE.

There is also that large group of students of the social and political sciences who use vital statistics. Their chief interests are to determine the facts of the progress, decline and prospects of mankind. They need, therefore, to understand the composition and structure of population; the changes in such characteristics of population and their meaning, and the losses which result from preventable disease and premature death. The gains from migration and birth are likewise within the scope of the work of these students. They are concerned with the factors which determine differential birth rates and death rates. The facts of marriage and divorce in relation to family life are of special interest to them. A course for such students should, therefore, give the principal facts of descriptive demography. Less emphasis need be placed on registration and the methods of office procedure, which are so vital to the registrar and to the public health worker, but more time must be spent on the relation of vital phenomena to other historical, social, and economic facts which bear upon the problems of life and death. Such allied considerations as family income, housing, working conditions, dietaries, etc., should be studied in relation to the public health. This will involve considerable instruction in the mathematical and logical treatment of facts. It is for this group of students especially that emphasis should be placed, in a vital statistics course, on the newer developments of mathematical statistics sufficient to qualify the student to determine the relation between variable phenomena and the degree of accuracy of the usual statistical measures.

VITAL STATISTICS EDUCATION FOR STUDENTS OF INSURANCE.

For nearly a century, actuaries and their students have been working more or less successfully in vital statistics. In fact, the higher forms of graduation and of analysis, so important in the field of vital statistics, have been developed by mathematicians and actuaries employed by the insurance companies as a necessary part of their business practice. In England and on the Continent, actuaries have laid the foundation for vital statistics, beginning with their contribution of life tables to the analysis of the phenomena of life and death.

A profitable field for the extension of vital statistics education is afforded by the group of students who prepare themselves for a career in actuarial science. While it will not be necessary to require of them a formal and thorough course such as given to public health students, it would be desirable for them to receive instruction in vital statistics as related to mortality. These students should become acquainted with the chief sources of information on population mortality. They should be familiar with the main facts of the death rates of groups of population by color, sex and age, especially for the more important diseases as causes of death. As the field of actuarial work widens, as new elements of risk, such as disability, sickness, old age dependency, occupational hazard, are added to underwriting work, more and more attention will need to be directed to official sources of data in American vital statistics. A closer bond between actuaries and the vital statisticians should in every way be encouraged.

There has not been, however, as much coöperation between actuaries and the other groups interested in the future progress of vital statistics as there might have been. This is perhaps due to the fact that until the Section on Vital Statistics of the American Public Health Association was formed, there was no organization whereby workers in the several fields could meet on a common ground and discuss the subject. In recent years, however, certain tendencies toward coöperation have become evident. The work of the Bureau of the Census, the Actuarial Society of America and the American Public Health Association in promoting the compilation of the "United States Life Tables" is an instance of what may be accomplished when the several groups work together for a common end. The Casualty Actuarial and Statistical Society has already endeavored to establish relations with those groups of vital statisticians who are interested in the subjects not comprised in the work of the life actuarial field. Subjects such as sickness statistics, especially the statistics of hospitals and other institutions, accident statistics, especially the facts for workmen's compensation cases, and other matters have been brought into the common field of the casualty actuary and the public health vital statistician, and discussed to great advantage.

In the foregoing text we have described various groups of students using vital statistics and its methods. It may be well at this point to condense the various suggestions as to programme into one statement, and this may be done as follows. These several groups of students need to be informed as to the content and purpose, first, of statistics in general, as a mode of approach to the facts of life, and second, as to vital statistics.

A BASIC PROGRAMME.

Statistics should be defined and taught as the method of collecting, tabulating and interpreting the facts for groups of persons, things, or events in terms of the groups. It should be shown that statistics produce various facts, whatever the subject-matter, and of these there are: (a) concrete facts of the kind or sort categories into which the individuals composing a group may be arranged, (b) the size classes into which the individual variates of a given kind or sort category may be displayed, (c) the convenient "shorthand" or averaging devices of statistics which enable one to grasp ideas of the size-type of a group; the degree of diversity of the individuals composing the group; the degree of association or correlation between one character of the group as compared with some other characteristic of the group, or with the same character of another group; the degree of symmetry of the distribution of the individuals composing the group. There should also be some instruction in the theory of probabilities as a means for determining the degree of approximation or reliability of the statistical measures employed, and in applied logic to test the validity of conclusions. Vital statistics, it should be shown, is the application of these methods and conceptions of statistics to vital phenomena.

Vital statistics itself may be further classed according to whether it treats of (a) the structure or composition of populations (static demography) and (b) the movement or functioning of such populations and their sub-divisions (dynamic demography). Under the subject of the structure and composition of population, the student should be taught the history and methods of census taking, the classification, tabulation and significance of the principal facts of population according to families, sex, age, country of birth, color or race, parentage, degree of education, mother tongue, etc. That branch of vital statistics which deals with the movement of population should take up in the descriptive and interpretive mode, the facts of birth, marriage, divorce, sickness, death and migration. In the treatment of these several subjects, the concepts and practical methods of statistics in general should be applied.

Under method, practical laboratory instruction should be given in the drafting of inquiry and registration schedules, the practical editing and criticism of returns, the preparation of tabulation sheets, cards, etc., the management of mechanical tabulating systems, of computing machines and reckoning devices, in the technique of authorship, in filing, finding and, the other disposition of published results, in graphic technique and in personal and office efficiency.